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Seeking evidence and explanation signals religious and scientific commitments

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ABSTRACT

Who is more committed to science: the person who learns about a scientific consensus and doesn't ask questions, or the person who learns about a scientific consensus and decides to pursue further inquiry? Who exhibits greater commitment to religious teachings: the person who accepts doctrine without question, or the person who seeks further evidence and explanations? Across three experiments (N = 801) we investigate the inferences drawn about an individual on the basis of their epistemic behavior – in particular, their decision to pursue or forgo further inquiry (evidence or explanation) about scientific or religious claims. We find that the decision to pursue further inquiry (about science or religion) is taken to signal greater commitment to science and to truth, as well as trustworthiness and good moral character (Studies 1–3). This is true even in the case of claims regarding controversial science topics, such as anthropogenic climate change (Study 3). In contrast, the decision to forgo further inquiry is taken to signal greater commitment to religion, but only when the claim under consideration contains religious content (Study 1–3). These findings shed light on perceived scientific and religious norms in our predominantly American and Christian sample, as well as the rich social inferences drawn on the basis of epistemic behavior.

In his influential work on the sociology of science, Robert Merton introduced the idea of "organized skepticism" as a norm that governs the scientific enterprise (Merton, 1973, p. 264). "Most institutions demand unqualified faith," he wrote, "but the institution of science makes skepticism a virtue" (Merton, 1938, p. 334). Whether or not this norm accurately characterizes all scientific behavior and aspirations, it nicely encapsulates a value that many uphold: the value of critical and unlimited inquiry. Yet in some walks of life, skepticism and unfettered inquiry can compete with other values. For instance, demanding an explanation for a friend's loyalty, or hiring a private investigator to gather evidence that a spouse is indeed faithful, could damage those relationships by sending a signal about one's (uncharitable) beliefs or (weak) commitment to the relationship. In fact, in economic games, examining the available evidence concerning the cost of engaging in cooperative behavior can be a maladaptive strategy for promoting cooperation (Hoffman, Yoeli, & Nowak, 2015). As Merton suggested, organized skepticism can interfere with "values which demand an unquestioning acquiescence." (Merton, 1938, p. 325)

Within some religious traditions, willingness to believe (e.g., in Jesus or in God) in the absence of evidence is itself regarded as a virtue. In the well-known story of "doubting Thomas," to take an example from the Christian tradition, Jesus tells his apostle who demanded evidence: "because thou hast seen me, thou hast believed: blessed [are] they that have not seen, and [yet] have believed" (John 20:29; King James Bible, 2017). Indeed, faith – whether it is faith in God or in one's spouse – may be an epistemic attitude that involves a certain abdication from the need for further evidence (Buchak, 2010; Buchak, 2012). The diverging norms of skepticism and faith introduce an interesting possibility: that the choice to pursue (vs. forgo) inquiry could send a signal about the strength and nature of one's commitments to scientific versus religious norms, and correspondingly, to science versus religion. That is, demanding further evidence or explanation could be seen as a mark of commitment regarding science, but a sign of doubt or insincerity in religion, at least within those traditions that value faith. Insofar as commitment to skeptical versus faith-based norms are taken to have other social or epistemic implications, we might also expect individuals who decide to pursue or forgo further inquiry regarding scientific or religious matters to be judged differentially moral, trustworthy, or committed to truth.

Based on these ideas, the current paper asks the following two

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questions: (1) What kinds of social and moral inferences do people (specifically, American and predominantly Christian adults) make on the basis of another person's evidence- and explanation-seeking? (2) Do inferences vary across the domains of science and religion?

1. Prior work on social inference and epistemic behaviors

Research has shown that people interpret others' decisions as signals of moral and socially relevant traits. For example, those who make harm-averse moral judgments or engage in third-party punishment are more trusted and preferred as social partners (Everett, Pizarro, & Crockett, 2016; Jordan, Hoffman, Bloom, & Rand, 2016; for a review, see Crockett, Everett, Gill, & Siegel, 2021). There is also evidence that epistemic information about an individual – in the form of their accuracy or reliability – influences moral and social judgments about them. For example, children as young as five years old infer that a puppet that communicates accurate (vs. inaccurate) information is also more prosocial (Brosseau-Liard & Birch, 2010). And in a study with adults, Goodwin, Piazza, and Rozin (2014) found that someone described as "intelligent" was taken to be more moral. Children and adults are also able to monitor epistemic behaviors such as question-asking and explanation-giving as cues to internal knowledge and competence (De Simone & Ruggeri, 2021; Lockhart, Chuey, Kerr, & Keil, 2019). It remains unknown, however, whether people infer moral and social traits on the basis of epistemic behaviors, such as the decision to pursue or forgo further inquiry, whether it take the form of seeking evidence or explanation.

Other bodies of work find evidence for variation in norms regarding inquiry across domains and/or individuals. For example, Liquin, Metz, and Lombrozo (2020) found that judgments about the "need for explanation" differ across the domains of science and religion. In particular, participants judged scientific statements – such as "the center of the earth is very hot" – to demand an explanation to a greater extent than religious statements – such as "there is a hell" – even when confidence in the truth of the two statements was matched (see also Liquin, Metz and Lombrozo, 2018). When participants were presented with the "explanation" that it's a mystery (e.g., "Why is the center of the earth very hot [is there a hell]? It's a mystery"), they judged the answer more acceptable for religious questions than for scientific ones, in part because they judged inquiry to be more viable and appropriate for science than for religion. Davoodi and Lombrozo (2022b) also found that inquiry was judged more viable and appropriate for scientific questions than for religious questions, and additionally found that an expert's ignorance (i.e., not knowing the answer to a question) concerning the answer to a science question was more threatening to the domain of science than an expert's ignorance concerning the answer to a religion question was to religion. These findings are consistent with the idea that, at least within a largely American and Christian population, science and religion are perceived to be governed by different norms for inquiry, consistent with the diverging norms of skepticism vs. faith.

There is also reason to believe that science and religion could differ when it comes to attitudes towards evidence. Van Leeuwen (2017) develops a proposal according to which science and religion tend to involve distinct epistemic attitudes – what he calls factual belief versus religious credence. A characteristic of the latter is that it is "evidentially invulnerable": religious credences are not typically extinguished by contrary evidence. This evidentiary attitude arguably stands in direct contrast to the nature of science: as Popper famously said, "In so far as a scientific statement speaks about reality, it must be falsifiable" (Popper, 2005, p. 316). If these views reflect how laypeople think about science, evidence should be more relevant to the evaluation of factual versus religious propositions. In fact, prior work has shown that scientific beliefs are more likely than religious beliefs to be justified with evidence (Metz, Weisberg and Weisberg, 2018; Shtulman, 2013). In contrast, religious and ideological beliefs are sometimes held to a lower evidential standard (McPhetres & Zuckerman, 2017), can be impervious to contrary evidence (Friesen, Campbell, & Kay, 2015), and are justified by appeal to intuition, morality, authority, and personal experience (e.g., Friesen et al., 2015; Metz et al., 2018; Shenhav, Rand, & Greene, 2012).

There is additional evidence to suggest that people might be sensitive to the distinction between factual belief and religious credence: for example, adults are more likely to use the word "think" in reference to the former and "believe" in reference to the latter (Heiphetz, Landers, & Van Leeuwen, 2021), with similar patterns found among other languages and cultures (Van Leeuwen, 2014; for relevant developmental findings, see Flavell, Flavell, Green, & Moses, 1990; Heiphetz, Spelke, Harris, & Banaji, 2013; Heiphetz, Spelke, Harris, & Banaji, 2014; Gottlieb, Keltner, & Lombrozo, 2018; Harris & Koenig, 2006). Adults and children are also more confident in scientific (vs. religious) beliefs (Clegg, Cui, Harris, & Corriveau, 2019; Davoodi et al., 2019; Harris, Pasquini, Duke, Asscher, & Pons, 2006; Shtulman, 2013). Together, this body of work suggests that scientific and religious beliefs may typically reflect different epistemic attitudes, such that inquiry (in the form of explanation and evidence) may be regarded as more relevant to the former than the latter.

Beyond potential variation in the role of inquiry across domains, attitudes towards inquiry (and especially evidence and justified belief) also vary across individuals (for relevant discussion, see Stanovich & Toplak, 2019). For instance, Metz et al. (2018) found that individual differences in valuing evidence as a justification for belief predicted endorsement of evolution vs. creationism. Additionally, Ståhl, Zaal, & Skitka (2016) found stable differences in attitudes towards evidence and that, for some individuals, evidence is not a mere preference, but is a moral value ("Moralized Rationality Scale"). This is reflected in agreement with items such as, "Being skeptical about claims that are not backed up by evidence is a moral virtue," and is dissociable from merely thinking that rationality is important ("Importance of Rationality Scale").

Though not much work has examined laypeople's endorsement of Mertonian norms (see Macfarlane & Cheng, 2008), some work has examined individual differences in embracing the inherent uncertainty of science (Johnson & Slovic, 1995; Rabinovich & Morton, 2012), and one recent paper identifies endorsement of other Mertonian norms – concerning the universality and shared ownership of scientific results – as factors in the acceptance of politicized science (Lewandowsky & Oberauer, 2021). Some work has also examined individual differences in "belief in science," as reflected in a scale including items such as "The scientific method is the only reliable path to knowledge" and "Science tells us everything there is to know about what reality consists of" (Farias, Newheiser, Kahane, & de Toledo, 2013).

In sum, prior work suggests that various decisions can serve as social signals, and that the domains of science and religion could differ in the epistemic attitudes they typically involve. Across three studies, we investigate novel questions that build upon this work: whether epistemic decisions (to pursue vs. forgo explanation or evidence) send different social signals across domains. Specifically, Study 1 investigates inferences from a character's decision to pursue (vs. forgo) evidence or explanation regarding a proposition about a topic that can be construed as scientific or religious. Study 2 replicates Study 1 and additionally investigates how inferences vary as a function of individual differences. Study 3 considers scientific topics, including some that are politically contentious (GMOs and anthropogenic climate change). Together, these studies shed light on how epistemic behaviors teach us not only about the natural world, but about the people who occupy it.

2. Study 1

In Study 1, we examined the inferences that participants in our sample drew from an agent's epistemic behavior. To do so, we presented a story about a character, Jen, who learns about a new issue: either near-death experiences (NDE) or the Shroud of Turin (scenario: NDE vs. Shroud). These issues were chosen because they can be framed as

scientific or religious (domain: scientific vs. religious). The character contemplates whether the issue requires further evidence or demands an explanation (inquiry: evidence vs. explanation). These two forms of epistemic behavior were included for generality; we did not predict differences between requiring further evidence or explanation. Critically, the character ultimately decides that the issue does or does not require further evidence or explanation (decision: pursue vs. forgo). Participants rated the morality of the character's behavior, her trustworthiness, and her commitment to truth, science, and religion. We predicted that the decision to pursue inquiry would be taken as a signal of scientific commitment, whereas the decision to forgo inquiry would be taken as a signal of religious commitment. We also predicted (but failed to find) that these effects would be strongest within their corresponding domain framing (scientific vs. religious).

2.1. Method

2.1.1. Participants

Participants in Study 1 were 97 adults recruited from Amazon Mechanical Turk (63 men, 34 women, mean age 36, age range 22–73) on December 6th, 2018. Participation was restricted to Amazon Mechanical Turk workers in the U.S. who had completed at least 5000 prior HITs with a minimum approval rating of 99%. Nine additional participants were excluded for leaving responses blank.

The sample was not very religious, as measured by the "experience" subscale of the religiosity inventory from Pennycook et al. (2012, items: "How important is religion in your daily life?," "How often do you attend religious services?," "How often do you pray?"). Participants' mean total of these items was 6.06 (SD = 4.43) on a scale from 0 (indicating no religious experience) to 15 (indicating the highest level of religious experience). Additionally, 0 was the modal score, with 54 (out of 97) participants indicating zero degree of religious experience on all items.

Simulations of Study 1 data revealed that with our sample of 97, we had 98.8% power to detect a main effect of inquiry decision on commitment to truth. More specifically, we used a bootstrapping approach: for a given iteration, we sampled (with replacement) 97 observations from Study 1 data and ran an ANOVA on that sample, which either yielded a significant result or not. We then determined the proportion of iterations which yielded a significant result, relative to the total iterations conducted overall (1000).

2.1.2. Materials and procedures

Participants were randomly assigned to read one of 16 possible vignettes about Jen, who learns about an issue and decides whether to inquire further about it. The issue was either near-death experiences or the Shroud of Turin (scenario: NDE vs. Shroud); we included more than one issue to increase the generalizability of our results. The issue was framed in a scientific or religious manner (domain: scientific vs. religious) to test the prediction that inquiry decisions would support stronger inferences of scientific or religious commitment regarding content within their respective domains.

To illustrate, the text for the Shroud of Turin with a scientific framing included the following:

> Jen learns about the shroud of Turin, a piece of cotton cloth that may have been the burial shroud that Jesus (1st century preacher and religious leader) was wrapped in after being crucified by the Roman government.
>
> Scientific findings in disciplines ranging from chemistry to biology shine light on whether the shroud of Turin is indeed the burial shroud of Jesus. Multiple radiocarbon dating and vibrational spectroscopy tests date the shroud between 300 BCE and 400 CE, corresponding with the timing of Jesus's crucifixion.
>
> Though most scientific leaders believe the shroud to be the burial cloth of Jesus, the matter is still not settled. Some people believe that it is not authentic and/or was created at a later date.

The version with religious framing was similar, but instead of offering scientific evidence and appealing to scientific consensus, it included biblical references and appealed to consensus among religious leaders (for all vignettes, see OSF repository: https://osf.io/nv2h3/?view_only=9906d7392e0d422ba5aa0a9aecb12c3a). After reading this information, participants learned about Jen's subsequent epistemic behavior: she either decided to pursue further inquiry or not (decision: pursue vs. forgo), and her inquiry took the form of either seeking (or not seeking) further evidence or seeking (or not seeking) an explanation (inquiry: evidence vs. explanation). We included two forms of inquiry to test the generality of our results. For the Shroud of Turin, for example, participants read one of the following sentences, depending on inquiry condition (evidence vs. explanation) and decision (indicated by text in brackets):

> Evidence: Jen decides that she does [not] need more evidence that the cloth was the burial shroud that Jesus was wrapped in.
> Explanation: Jen decides that she does [not] need an explanation for how the shroud came to have its characteristic markings.

Crossing scenario (NDE vs. shroud), domain (scientific vs. religious), decision (pursue vs. forgo), and inquiry type (evidence vs. explanation) resulted in the 16 distinct vignettes.

After reading the vignette, participants were asked to rate 14 statements designed to probe their inferences about the character, including her morality, trustworthiness, commitment to truth, commitment to science, and commitment to religion. All items and rating anchors are indicated in Table 1. Items about truth, science, and religion were presented in random order before items about morality and trustworthiness. Participants then answered an open-ended question about what

Table 1
Moral and character inference items used in Studies 1–3.

Item	Rating Scale
Morality	
Jen's decision that […] was…	1 = "very immoral/bad" 7 = "very moral/good"
Trustworthiness	
Jen is probably…	1 = "very untrustworthy" 7 = "very trustworthy"
Commitment to truth (α = 0.88 / 0.79 / 0.75)	
Jen values truth above all.	1 = "strongly disagree" 7 = "strongly agree"
When it comes to what she believes, Jen cares about getting things right.	
Jen is not concerned about whether she is right or wrong.*	
Jen values some things more than getting things right.*	
Commitment to science (α = 0.94 / 0.94 / 0.86)	
Jen has a strong commitment to the methods of science.	1 = "strongly disagree" 7 = "strongly agree"
Jen is a deeply scientific person.	
Jen values her identity as a scientifically-minded person.	
Jen trusts scientific authorities.	
Commitment to religion (α = 0.93 / 0.94 / 0.94)	
Jen has strong religious faith.	1 = "strongly disagree" 7 = "strongly agree"
Jen is a deeply religious person.	
Jen values her religious identity.	
Jen trusts religious authorities.	

Note. Items that were reverse-scored are indicated with an asterisk. For sets of items that were averaged to reflect a single construct, we report Cronbach's α for Studies 1–3, respectively.

they thought of the fact that the character did [not] pursue further evidence or explanation.

Next, participants completed a set of individual difference measures. These were included for exploratory purposes to inform the design of Study 2. The measures that we included were the religiosity inventory from Pennycook et al. (2012), Paranormal Belief Scale items sampled from Tobacyk (2004), the Moralized Rationality and Importance of Rationality scales from Ståhl et al. (2016), "Nature of Science" comprehension from Study 3 of Gottlieb et al. (2018), and the Belief in science scale from Farias et al. (2013); all scale items are reported in the OSF repository. Although we expected Study 1 to be underpowered with regard to the moderating influence of individual differences, we observed a number of main effects and interaction effects of the individual difference variables. We report individual difference analyses for Study 1 in the OSF repository, as these are revisited with larger samples in Studies 2–3. Finally, participants reported their age and gender.

2.2. Results

Our key dependent variables were the single ratings for morality and trustworthiness, as well as our composite ratings for commitment to truth, science, and religion, which were calculated by averaging the four ratings for each scale. The reliability of these scales, as assessed by Cronbach's α, ranged from good to excellent (see Table 1). For each dependent variable, we performed an ANOVA with domain framing (scientific vs. religious), decision (pursue vs. forgo), inquiry (evidence vs. explanation), and scenario (Shroud of Turin vs. NDE) as between-subjects factors (see Fig. 1a). Given the large number of tests, we adopted the more conservative p-value of 0.01 as our threshold for significance; we report all significant effects.

2.2.1. Morality and trustworthiness

The ANOVA with ratings of morality as a dependent variable revealed a main effect of decision: pursuing inquiry was rated as more moral than forgoing inquiry, $F(1,81) = 37.58$, $p < .001$. Analysis of trustworthiness as a dependent variable also revealed a main effect of decision, $F(1,81) = 22.22$, $p < .001$, such that the character was rated as more trustworthy when she decided to inquire than when she decided not to.

2.2.2. Commitment to truth

Analyzing composite ratings of commitment to truth also showed a main effect of decision, $F(1,81) = 70.40$, $p < .001$, with decisions to inquire associated with higher perceived commitment to truth. However, this effect was qualified by a significant interaction with domain, such that decision had a greater impact on perceived commitment when the issue was framed as religious (vs. scientific), $F(1,81) = 8.41$, $p = .005$.

2.2.3. Commitment to science

Commitment to science exhibited a similar pattern to commitment to truth, with a significant main effect of decision such that pursuing inquiry was associated with greater commitment, $F(1,81) = 45.208$, $p < .001$, but also a marginal interaction with domain, such that decision had a numerically larger impact with a religious (vs. scientific) framing, $F(1,81) = 5.95$, $p = .02$.

2.2.4. Commitment to religion

Finally, composite religious commitment ratings revealed a significant main effect of decision, $F(1,81) = 45.618$, $p < .001$, but in a direction opposite to that observed for our other dependent variables: the decision to inquire was associated with lower perceived commitment to religion. Once again, there was a suggestive trend for decisions to be

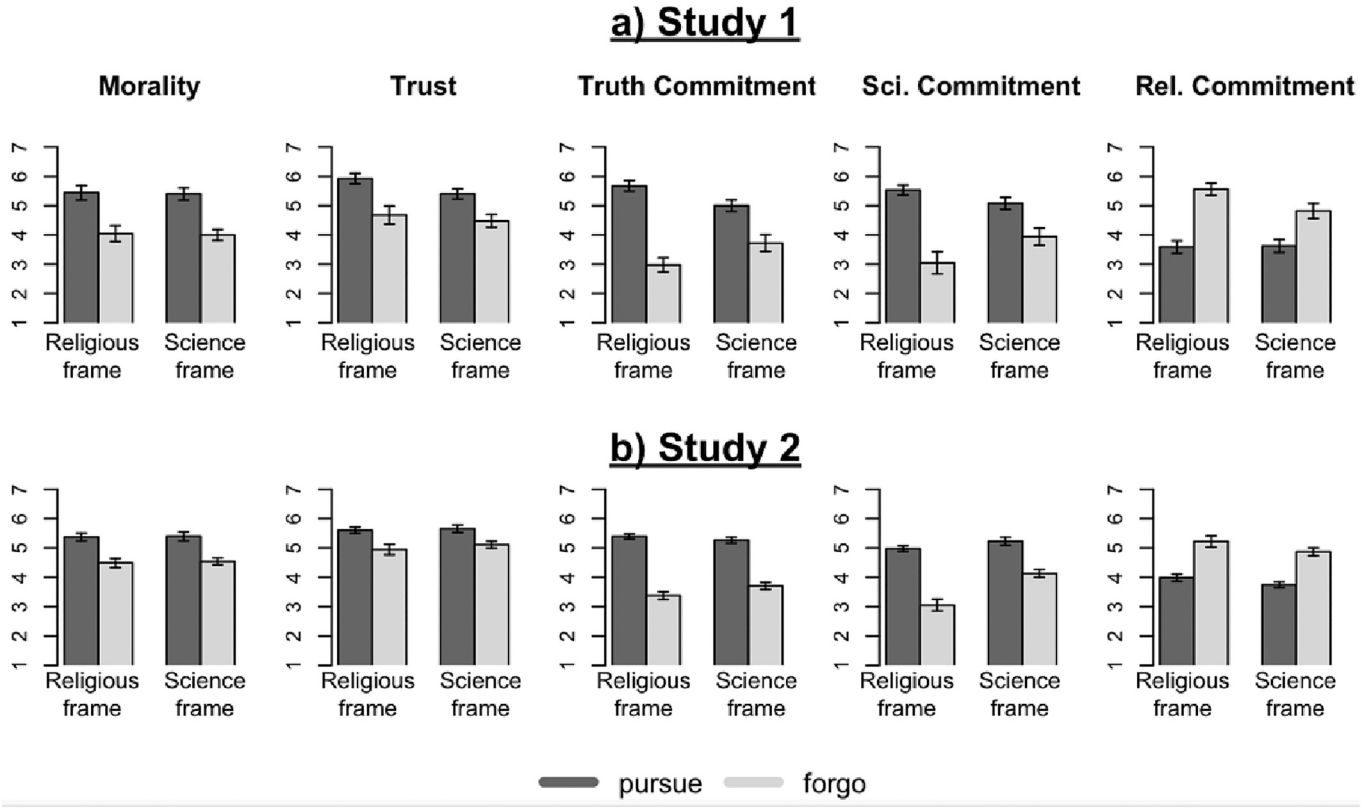

Fig. 1. Inference about a character's morality and commitment in Studies 1–2.
Note. Average ratings, by condition, of (left-right) the character's morality, trustworthiness, and commitment to truth, science, and religion for a) Study 1 and b) Study 2. Error bars indicate SEM.

more informative in the religious domain (decision x domain interaction), $F(1,81) = 2.72$, $p = .10$. There was also a significant main effect of scenario, qualified by an interaction with decision, such that perceived commitment to religion was rated higher when Jen learned about the Shroud of Turin, $F(1,81) = 10.68$, $p = .001$, especially when Jen decided not to pursue inquiry, $F(1,81) = 9.56$, $p = .002$. However, the finding that religious commitment was rated higher when Jen decided to forgo (vs. pursue) inquiry held for all conditions.

2.2.5. Open-ended responses

Open-ended responses were reviewed by both authors to ensure that participants understood the task, and they were subsequently coded for the inclusion of key words using an automated script (see OSF repository). Most notably, we found that mentions of "faith" (e.g., "Because she chooses to believe in her faith"), varied across inquiry decisions: there were seven occurrences when inquiry was not pursued, and only one instance when it was (Fischer's exact test: $p = .027$, odds ratio = 8.417). This finding, while based on small numbers, is consistent with the idea that participants used epistemic decisions to draw inferences about norms for inquiry differentially associated with science and religion.

2.3. Discussion

Participants in our study viewed evidence- and explanation-seeking behaviors favorably, with the decision to pursue evidence or explanation seen as morally good and a cue to trustworthy character. Evidence- and explanation- seeking were also treated as a signal of commitment to truth and to science, whereas forgoing further inquiry was treated as a signal of commitment to religion. These effects were remarkably consistent across modes of inquiry (evidence versus explanation), and across our manipulation of the domain framing (scientific versus religious), though we found modest evidence that pursuit decisions might be regarded as more informative in the domain of religion than science. We initially hypothesized that the effect of inquiry decisions on inferences about the character would be moderated by participants' own religious and scientific commitments. Because our sample was overwhelmingly non-religious, however, we were unable to test this hypothesis. We revisit this question in Study 2, for which we recruited a more religious sample.

3. Study 2

In Study 2, we again tested the effect of epistemic behaviors (pursuing vs. forgoing evidence or explanation) and domain framing (religious vs. scientific) on inferences about morality, trustworthiness, commitment to truth, commitment to science, and commitment to religion. However, we restricted participation to Amazon Mechanical Turk workers from the nine states in the United States with the highest proportion of religious residents – this involved drawing from the generally protestant population of the Southern United States: Alabama, Mississippi, Tennessee, Louisiana, Arkansas, South Carolina, West Virginia, Oklahoma, and Georgia (Lipka & Wormald, 2016). We also aimed to strengthen the manipulation of domain framing (religious vs. scientific), editing scenarios to be more identifiably religious or scientific.

By including a larger and more religious sample, Study 2 also allowed us to test two hypotheses about individual differences that could moderate the effect of inquiry decision on perceived morality and trustworthiness: religiosity and commitment to scientific ideals. Specifically, we predicted that the more religious participants in our sample would see greater value in the epistemic attitude of faith, resulting in higher ratings of morality and trustworthiness (relative to non-religious participants) after the character decides to forgo further inquiry. On the other hand, participants who strongly endorse scientific ideals might be especially likely to value norms associated with science (such as skepticism) and therefore judge the character more favorably for pursuing inquiry (relative to participants who do not strongly endorse such ideals).

To assess endorsement of scientific ideals (such as skepticism), we used three existing individual difference measures from the literature. The first was the "Belief in science" scale from Farias et al. (2013). The scale includes some items that plausibly reflect endorsement of the norm of skepticism (e.g., "We can only rationally believe in what is scientifically provable"), but also others that potentially reflect disdain for religion ("Science provides us with a better understanding of the universe than does religion") or for other human endeavors relative to science ("All the tasks human beings face are soluble by science"; "Science is the most valuable part of human culture"). We also included two measures developed in Ståhl et al. (2016): the Moralized Rationality and Importance of Rationality scales. The former measures the extent to which reliance on logic and evidence in belief formation is regarded as a moral virtue (e.g., "Being skeptical about claims that are not backed up by evidence is a moral virtue"); the latter measures the extent to which an individual regards logic and evidence as important in their own belief formation (e.g., "It is important to me personally to be skeptical about claims that are not backed up by evidence").

3.1. Method

3.1.1. Participants

Participants in Study 2 were 304 adults recruited from Amazon Mechanical Turk (117 men, 186 women, mean age 40, age range 19 to 77) between December, 28, 2018 and January 8, 2019. Participation was restricted to MTurk workers from Alabama, Mississippi, Tennessee, Louisiana, Arkansas, South Carolina, West Virginia, Oklahoma, and Georgia. Twenty-two additional participants were excluded for failing at least one of three attention checks (explained below).

The population in Study 2 was more religious than that of Study 1, as measured by the "experience" subscale of the religiosity inventory from Pennycook et al. (2012). Participants' mean score was 8.19 (SD = 5.16) out of 15, and the modal score was this highest value, with 60 out of 304 scoring 15 on religious experience.

Simulations of Study 2 data revealed that with our sample of 304, we had 96.9% power to detect a main effect of inquiry decision on commitment to truth, and 58.8% power to detect an interaction between inquiry decision and Belief in science in predicting commitment to science. (Based on Study 1 data, we had >99.9% power to detect this interaction.)

3.1.2. Materials and procedure

The materials and procedures were the same as those in Study 1, except that we edited Study 1 vignettes to further differentiate scientific versus religious framing and we dropped the measure of Nature of Science and paranormal belief included in Study 1 (to reduce the length of the task and because the findings from Study 1 suggested weaker associations between these measures and our variables of interest).

As in Study 1, participants read a story about either the Shroud of Turin or near-death experiences (content: Shroud vs. NDE), framed in either a scientific or religious manner (domain: scientific vs. religious), where the character either makes a decision to pursue or forgo further inquiry (decision: pursue vs. forgo), either in the form of evidence or explanation (inquiry: evidence vs. explanation). The vignettes resembled those in Study 1, with minor edits to further differentiate the scientific versus religious framing. For example, for the religious version of the Shroud of Turin vignette, where Study 1 included the text, "could it be the burial shroud of Christ?," the Study 2 version instead included, "could it be the burial shroud of Jesus Christ, son of God?" (see OSF repository for all vignettes).

After reading the vignette, participants answered the same questions from Study 1: four questions each about commitment to truth, commitment to science, and commitment to religion, presented in randomized order, and then a question each about morality and

trustworthiness, also randomized (see Table 1). Then, participants answered an open-ended question: "what do you think of the fact that she [needs/does not need] [evidence/explanation] [on the topic]?"

Next, participants completed the individual difference measures, which were a subset of those included in Study 1. Those retained were the religiosity inventory from Pennycook et al. (2012; sample items: "There is a life after death," "Religious miracles occur"), the Moralized Rationality and Importance of Rationality scales from Ståhl et al. (2016), and the Belief in science scale from Farias et al. (2013; sample items: "Science provides us with a better understanding of the universe than does religion," "Science is the most valuable part of human culture"), presented in this order. An attention check ("select 'somewhat agree'") was included in the Belief in science scale.

After reporting their age, gender, religious affiliation, and political orientation (i.e., conservatism, measured on a scale from 0 ("very left") to 6 ("very right")), participants answered two additional attention check questions about the content of their vignette and Jen's decision; these were simple multiple-choice questions based on what they had read. The question about the decision was, "What did Jen decide," with two options: "she decided she needed […]" versus "she decided she did not need […]" The question about content was tailored to the specific topic, so participants in the NDE vignette condition chose between "near-death experiences" and "psychedelic experiences" and participants in the "Turin" vignette condition chose between "[…] burial shroud […]" and "[…] birth shroud […]." Twenty-two participants were excluded from analyses for failing to correctly answer at least one of the three attention check questions; most excluded participants (17 out of 22) failed the attention check question buried in the Belief in science scale.

3.2. Results

As with Study 1, our key dependent variables were the single ratings for morality and trustworthiness, as well as our composite ratings for commitment to science, religion, and truth, calculated by averaging the four ratings for each scale. The reliability of these scales, as assessed by Cronbach's α, ranged from good to excellent (see Table 1). For each dependent variable, we performed an ANOVA with domain framing (scientific vs. religious), inquiry decision (pursue vs. forgo), inquiry type (evidence vs. explanation), and scenario (shroud vs. NDE) as between-subjects factors (see Fig. 1b). Given the large number of tests, we adopted the more conservative p-value of 0.01 as our threshold for significance, and we report all significant effects.

3.2.1. Morality and trustworthiness

The ANOVA with ratings of morality as a dependent variable again revealed a main effect of decision, $F(1, 288) = 39.50$, $p < .001$, as well as a marginal interaction between domain, decision, and inquiry type, $F(1, 288) = 6.51$, $p = .01$. Both kinds of inquiry were associated with higher moral goodness judgments, but explanation-seeking behaviors were more informative for morality in a scientific context than a religious one, and conversely, evidence-seeking behaviors were more informative in a religious context than a scientific one. There was also an interaction between decision and scenario, such that the main effect of decision was more pronounced in the NDE scenario, $F(1,288) = 6.95$, $p = .008$. These interactions were not predicted, and plausibly reflect idiosyncrasies in item wording; in all cases, the decision to pursue inquiry was associated with higher ratings for morality than the decision to forgo inquiry.

Analysis of trustworthiness judgments also revealed a main effect of decision, $F(1,288) = 20.25$, $p < .001$, with the decision to pursue inquiry associated with greater trustworthiness.

3.2.2. Commitment to truth

Analyzing composite ratings of commitment to truth revealed a main effect of decision, $F(1,288) = 266.52$, $p < .001$, with greater perceived commitment when inquiry was pursued, and a main effect of inquiry type, $F(1,288) = 16.78$, $p < .001$, with greater perceived commitment in the evidence condition than in the explanation condition. There was also a marginal interaction between decision and domain, $F(1,288) = 4.52$, $p = .03$, with decision having a greater impact in the religious condition.

3.2.3. Commitment to science

Analysis of commitment to science revealed a main effect of decision, $F(1,288) = 111.10$, $p < .001$, a main effect of domain, $F(1,288) = 21.675$, $p < .001$, as well as an interaction between decision and domain, $F(1,288) = 8.813$, $p = 003$. As in Study 1, the character was regarded as having a stronger commitment to science when she sought out inquiry, an effect more pronounced in the religious domain condition. Overall, the character was also perceived as having a lower commitment to science in the religious domain condition. There were also main effects of domain and scenario, such that the character was perceived as having a stronger commitment to science both when the issue was framed as scientific (vs. religious), $F(1,288) = 21.23$, $p < .001$, and when the issue was near-death experiences (vs. Shroud of Turin), $F(1,288) = 9.48$, $p = .002$. Again, these interactions were not predicted, and plausibly reflect idiosyncrasies of our stimuli; in all cases, the decision to pursue inquiry was associated with greater commitment to science than the decision to forgo inquiry.

3.2.4. Commitment to religion

The analysis of composite commitment to religion revealed a main effect of decision in the opposite direction of morality, trustworthiness, commitment to truth, and commitment to science, as in Study 1. Forgoing inquiry was associated with greater commitment to religion, $F(1,288) = 86.626$, $p < .001$. There was also a main effect of scenario, $F(1,288) = 38.349$, $p < .001$, as well as an interaction between decision and scenario, $F(1,288) = 15.75$, $p < .001$, such that for the Shroud of Turin scenario, perceived commitment to religion was higher overall, and decision condition was more influential. However, the decision to forgo (vs. pursue) inquiry was associated with higher commitment to religion in all conditions.

3.2.5. Individual differences

We additionally explored whether any of our individual difference measures moderated the effect of inquiry decision on judgments (see Fig. 2). To do so, for each individual difference measure (conservatism, religiosity, Belief in science, Moralized rationality, Importance of rationality) and each judgment (morality, trustworthiness, commitment to truth, commitment to science, commitment to religion), we constructed a pair of mixed effects models predicting the judgment. The "full" model included decision condition, religious vs. scientific domain condition, and a given individual difference variable modeled as a fixed effect, with scenario as a random effect with respect to intercept. The second model was a "partial" model that included everything in the full model, with the exception of the interaction effect between decision condition and the individual difference variable. (The models did not include the three-way interaction between decision condition, domain condition, and the individual difference variable.) We then ran a model comparison to determine if the interaction between decision condition and each individual difference variable was significant. Additionally, we ran the same model comparison method to check whether any domain by individual difference variable interaction was significant (none were), as well as checking whether any three-way interaction was significant (none were). All significant effects ($p < .01$) are reported here.

This method of analysis first revealed that participant conservatism and religiosity had similar moderating effects on judgments, at least for perceived morality and trustworthiness. Participant conservatism dampened the effect of decision on perceived morality, $X^2(1) = 5.81$, $p = .015$, and trustworthiness, $X^2(1) = 6.52$, $p = .01$, with the participants highest in conservatism not viewing pursuing (vs. forgoing) inquiry as more moral or trustworthy. So, too, for participant religiosity, such that, unlike the general sample, those highest in religiosity did not view

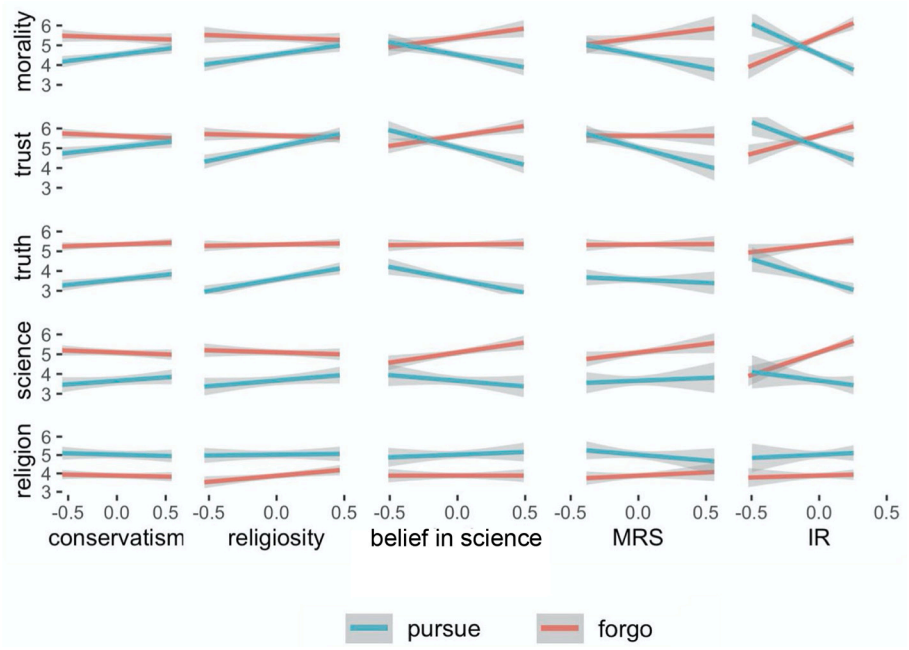

Fig. 2. Moderating effects of individual difference variables on character inferences in Study 2.
Note. Estimated linear regression lines of judgments (Y axes: morality, trust, commitment to truth, commitment to science, and commitment to religion) based on the character's decision to forgo (blue) or pursue (red) inquiry, moderated by participant variables (X axes: conservatism, religiosity, Belief in science, Moralized rationality, and Importance of rationality; all normed on a scale from 0 to 1 and then centered). Shading represents 95% CI. (For interpretation of the references to color in this figure legend, the reader is referred to the web version of this article.)

pursuing (vs. forgoing) inquiry as any more moral, $X^2(1) = 6.95$, $p = .008$, or trustworthy, $X^2(1) = 14.972$, $p < .001$. Participant religiosity also moderated perceived commitment to truth, albeit to a weaker extent: while participants at all levels of religiosity saw the character who pursues (vs. forgoes) inquiry as more committed to truth, this effect was less pronounced among more religious participants, $X^2(1) = 7.85$, $p = .005$.

For the most part, participant Belief in science exerted a moderating effect almost opposite to that of participant religiosity, except that Belief in science also influenced inferences of commitment to science. Higher participant Belief in science was associated with *larger* effects of decision with regard to judgments of morality, trustworthiness, commitment to truth, and commitment to science. As with participant religiosity, participant Belief in science exerted more extreme moderating effects in the case of perceived morality, $X^2(1) = 15.48$, $p < .001$, and trustworthiness, $X^2(1) = 27.407$, $p < .001$, with participants lowest in Belief in science not influenced by decision condition in making these judgments. Belief in science also heightened the main effects of decision for judgments of commitment to truth, $X^2(1) = 8.63$, $p < .003$, and commitment to science, $X^2(1) = 7.373$, $p = .006$, although participants at all levels of Belief in science saw the character who pursues (vs. forgoes) inquiry as more committed to truth and to science.

Somewhat like Belief in science, and unlike conservatism, the Moralized Rationality Scale (MRS) moderated judgments of morality, $X^2(1) = 8.9324$, $p = .002$, and trustworthiness, $X^2(1) = 7.7008$, $p = .005$, such that those lowest in MRS did not show an effect of decision condition in judgments of morality and trustworthiness.

The Importance of Rationality (IR) scale also moderated perceived morality, trustworthiness, commitment to truth, and commitment to science. With regard to commitment to truth, $X^2(1) = 15.69$, $p < .001$, and to science, $X^2(1) = 11.448$, $p < .001$, participants lowest in IR did not show an effect of decision condition. In the case of morality, $X^2(1) = 48.611$, $p < .001$, and trustworthiness, $X^2(1) = 29.963$, $p < .001$, the usual effects actually *reversed*, such that those lower in IR judged *forgoing* inquiry as more moral and trustworthy.

3.2.6. Open responses

As in Study 1, we conducted an exploratory analysis of open-ended responses (see OSF repository). Replicating Study 1, we found a significant difference in references to "faith" across decision conditions, with 30 responses mentioning "faith" in the forgo inquiry condition, versus 15 in the pursue condition (Fisher's exact test: $p = .008$, odds ratio = 2.475).

3.3. Study 2 discussion

In Study 2, we replicated our main findings from Study 1 with a larger and more religious sample drawn predominantly from the American South. Evidence- and explanation- seeking were regarded as signals of morality and trustworthiness, and of commitment to truth and to science, but were also associated with lower commitment to religion. We also found additional evidence of a trend observed in Study 1: inquiry decisions in the domain of religion (vs. science) were generally more informative in the sense that they had a larger impact on inferences about the character's commitments, especially to science.

Going beyond Study 1, we identified individual difference measures – conservatism, religiosity, Belief in science, Moralized rationality, and Importance of rationality – that moderated judgments of morality and trustworthiness, with some individual differences moderating inferences about commitment to truth and to science as well. Relative to other participants, participants high in Belief in science, Moralizing rationality, and Importance of rationality exhibited a more pronounced effect of inquiry condition (pursue vs. forgo), preferring the pursuit of inquiry. Higher scores for Belief in science and Importance of rationality additionally increased participants' propensity to infer higher commitment to truth and science for the character who pursues inquiry relative to the character who forgoes. On the other hand, religious participants and conservative participants tended to draw inferences about the character's morality and trustworthiness that were less dependent on her decision about whether to pursue or forgo inquiry; additionally, religious participants were also less influenced by the character's decision in drawing inferences about her commitment to truth. Finally, it was only those participants who actively rejected the Importance of rationality who showed a reversal, such that forgoing inquiry was associated with greater morality and trustworthiness than pursuing inquiry.

In sum, Study 2 provides additional support for inferences from inquiry behavior in the context of two topics: near-death experiences and the Shroud of Turin. As in Study 1, participants judged a character who pursues inquiry as more moral, trustworthy, and committed to truth and to science, but as less committed to religion.

4. Study 3

In Studies 1 and 2, we found robust evidence that adult participants residing in the US readily infer social traits (i.e., about morality, trustworthiness, and commitment to truth, science, and religion) on the basis of a character's epistemic decision (i.e., to pursue or forgo inquiry) when faced with a new topic, whether that topic was the Shroud of Turin or near-death experiences, framed in either a religious manner (domain: religious) or a scientific manner (domain: scientific). However, there is a sense in which the Shroud of Turin and/or near-death experiences could be seen as religious, regardless of framing. In Study 3, we aim to move away from the domain of religion to test inferences from epistemic behavior in purely scientific domains. One aim of doing so is to test the prediction that the effects from Study 1 and Study 2 will extend to a new set of (scientific) scenarios.

To address a second aim of Study 3, we manipulated the type of scientific topic: "neutral" vs. "controversial" science. There are certain scientific topics that, despite scientific consensus, are highly politicized and/or controversial among the general public (e.g., Frewer, Howard, & Shepherd, 1998). Human evolution and anthropogenic climate change are cases in point. It's not antecedently obvious whether the same inferences from epistemic behavior extend to these "controversial" instances of science. On the one hand, the pursuit of inquiry in Studies 1 and 2 was seen as indicative of a commitment to science, and such behaviors of "organized skepticism" have been touted by scientists and sociologists of science (such as Robert Merton) as the hallmark of science. This suggests that pursuing (vs. forgoing) inquiry concerning (for instance) climate change should be regarded as evidence of scientific commitment. On the other hand, one can imagine that lay people might be branded as anti-scientific for doing their own research in the face of a scientific consensus (e.g., Sunstein & Vermeule, 2008). Lee, Yang, Inchoco, Jones, and Satyanarayan (2021) documented an interesting phenomenon whereby people with skeptical attitudes towards COVID-19 consensus had looked into original sources and created their own visualizations from raw data (i.e., they had sought evidence and/or explanations). Who is more committed to scientific norms and ideals: the person who learns about a scientific consensus and decides to pursue inquiry, or the person who learns about a scientific consensus and doesn't ask questions? In Study 3 we directly test this question, thus investigating a plausible boundary condition on the inference from an individual's inquiry behavior to her commitment to science. By measuring variation in participants' "Belief in science," moralization of rationality, and importance of rationality (as in Study 2), we can also see whether responses to epistemic behavior concerning neutral vs. controversial science are moderated by these individual differences.

The design, sample size, exclusion criteria and analyses for Study 3 were pre-registered and are available at https://aspredicted.org/MOK_APK.

4.1. Method

4.1.1. Participants

Participants in Study 3, as specified in our pre-registration, were 400 adults recruited from Amazon Mechanical Turk (152 men, 244 women, 4 other/unspecified; mean age 40, age range 19 to 77); recruitment occurred between April 18, 2019 and July 1, 2019 following the pre-registered procedure ("We will initially collect 400 observations and 'peek' at the data, only looking at responses to the check question to determine how many more participants are needed … and so on, until we have 400 usable participants.")

Participation was again restricted to MTurk workers from Alabama, Mississippi, Tennessee, Louisiana, Arkansas, South Carolina, West Virginia, Oklahoma, and Georgia. An additional 43 participants were excluded for failing at least one of the three attention check questions included in the study. Our pre-registration specified that participants would be excluded for failing to correctly respond to two easy questions at the conclusion of the study, or to an attention check item, detailed in the Materials & Procedure below. The pre-registration also specified that participants would be excluded for failing one or more questions about specific scientific content; however, due to experimenter error, those questions were not implemented in the experiment. Therefore, we could only exclude on the basis of the aforementioned three questions.

The population in Study 3 was again more religious than that in Study 1, as measured by the "experience" subscale of the religiosity inventory. Participants' mean score was 8.90 (SD = 5.18) out of 15, with 99 out of 400 participants indicating the highest degree of religious experience.

Simulations of Study 3 data revealed that with our sample of 400, we had >99.9% power to detect a main effect of inquiry decision on commitment to truth, and 1% power to detect an interaction between inquiry decision and Belief in science in predicting commitment to science. (Based on Study 2 data, we had 67.3% power to detect this interaction.)

4.1.2. Materials and procedures

The materials and procedure were similar in structure to Studies 1 and 2, with a few modifications to target inferences from learning about "neutral" and "controversial" scientific content and to address potential confounds relating to character gender. We decided to manipulate character gender because we were concerned that gender stereotypes about science could limit the generalizability of our results (e.g., Carli, Alawa, Lee, Zhao, & Kim, 2016). This resulted in a 2 (decision: pursue vs. forgo) x 2 (content: controversial science vs. neutral science) x 2 (inquiry: evidence vs. explanation) x 2 (gender: man vs. woman) design. We created a new set of vignettes in which a character learns about either a "neutral" scientific topic (big bang theory or gravitational waves) or a "controversial" scientific topic (genetically modified crops or human-caused climate change); see OSF repository for vignettes. "Neutral" vignettes emphasized a basic science topic that reflects scientific consensus and that has not been heavily politicized, for example:

> For the first time [Suzy/Billy] learns about the Big Bang theory, the prevailing astronomical model of the expansion of the universe. The theory describes how the universe started and expanded ~13.8 billion years ago from a low-volume, high-density and high-temperature state and started cooling and forming particles in the process.
>
> A range of astronomical phenomena provide evidence in favor of the Big Bang theory, including the existence of microwave radiation and the fact that galaxies that are farther away from earth move faster from earth. While most scientific authorities agree with the Big Bang theory, the matter is not settled. For instance, the Big Bang theory cannot explain why the universe has a flat shape instead of a curved shape. While the Big Bang theory remains the prevailing theory of the expansion of the universe, some cosmologists have proposed alternate theories.

Based on inquiry condition (evidence vs. explanation), participants then read about the character's decision about whether to pursue or forgo more evidence/explanation:

> Explanation: After learning about the Big Bang theory, [Suzy/Billy] decides that (s)he [needs /does not need] an explanation for the expansion of the universe.
> Evidence: After learning about the Big Bang theory, [Suzy/Billy] decides that (s)he [needs/does not need] more evidence in favor of the Big Bang theory.

Participants in the "controversial" science condition read about a contested and politicized issue that could reflect scientific consensus but not necessarily mainstream consensus. For example:

For the first time [Suzy/Billy] learns about mechanisms driving global warming, a long-term change in the average temperature of Earth's climate system.

Human activity has contributed to unprecedented temperature levels in recent decades in a number of ways. One way is through humans' role in the increase of "greenhouse gases" in the atmosphere (such as carbon dioxide and methane), which trap heat from the sun. Human activities that use fossil fuels, such as manufacturing and transportation, increase carbon dioxide levels; and the meat industry, especially cows, increase levels of methane. 97% of scientists agree that human activity is the main cause of global warming. However, the matter is not settled. There are some other non-human factors that also affect global temperatures, such as orbital variations (earth moving around the sun a little differently), natural variation in earth's temperature every few thousand years (though less extreme than observed variation), increases in the sun's output (the sun is hotter than it used to be), and a potential role of volcanic activity.

And the character's decision:

Explanation: After learning about some mechanisms driving global warming, [Suzy/Billy] decides that (s)he [needs/does not need] an explanation for the unprecedented rise in earth's temperature levels.
Evidence: After learning about some mechanisms driving global warming, [Suzy/Billy] decides that (s)he [needs/does not need] more evidence to support the consensus that human activity is the main driver of global warming.

After reading the vignette, as in Studies 1 and 2, participants answered questions about the character's morality and trustworthiness and commitment to truth, science, and religion (see Table 1). The questions about truth, science, and religion were presented first in randomized order before the questions about morality and trustworthiness, which were also randomized.

Participants were then asked to infer the character's prior belief on all four issues: "Prior to learning the information just presented about [the big bang theory/gravitational waves/genetically modified foods/global warming], what is the probability that Suzy would have agreed with the claim that human activity is the main cause of global warming (0-100) / gravitational waves exist (0-100) / genetically modified crops are safe for human consumption (0-100) / the Big Bang theory explains the expansion of the universe (0-100)." The order of each claim was randomized. These questions were included to help rule out an alternative explanation for a plausible pattern of results. If we found that participants inferred a low commitment to science from the need for more evidence or explanation, this could be because they inferred a low prior commitment to scientific consensus.

Participants additionally completed two exploratory measures: they were asked about the "normality" of the character's epistemic behavior, and they were asked generalization questions about whether the character would pursue further evidence / explanation about other science topics. These are reported in the OSF repository.

The final part of the experiment consisted of a number of individual difference variables. On a 7-point scale from "strongly disagree" to "strongly agree," participants indicated their own agreement with claims relating to each of the four vignettes; namely, that "Genetically modified crops are safe to eat," that "Human activity is the main driver of global warming," that "the Big Bang theory explains the expansion of the universe," and that "gravitational waves exist." All claims were presented in randomized order. Then, as in Study 2, participants completed the religiosity inventory from Pennycook et al. (2012;), the Moralized rationality and Importance of rationality scales from Ståhl et al. (2016), and the Belief in science scale from Farias et al. (2013), presented in this order. An attention check question ("Please select 'strongly disagree') was included in the Belief in science scale.

Finally, participants indicated: their religious affiliation, age, gender, and political affiliation (conservatism; reported on a 7-point scale from "Very left" to "Very right"). Participants then completed two more attention check questions in addition to the attention check hidden in the Belief in science scale. One concerned content: "What did [Suzy/Billy] learn about?" with options for "big bang theory," "genetically modified crops," "climate change," "gravitational waves," "near-death experiences," and "shroud of Turin." The other concerned the decision: "What did [Billy/Suzy] decide?" with options for "[Billy/Suzy] decided the issue did not need further [evidence/explanation]" or "[Billy/Suzy] decided the issue needed further [evidence/explanation]."

4.2. Results

As with Studies 1 and 2, our key dependent variables were the single ratings for morality and trustworthiness, as well as our composite ratings for commitment to truth, science, and religion, calculated by averaging the four ratings for each scale (see Fig. 3). The reliability of these scales, as assessed by Cronbach's α, ranged from good to excellent (see Table 1). As specified in our pre-registration, we performed an ANOVA for each dependent variable with science type (neutral vs. controversial), decision (pursue vs. forgo), inquiry type (evidence vs. explanation), and character gender (man vs. woman) as between-subjects factors. Given the large number of tests, we adopted the more conservative p-value of 0.01 as our threshold for significance, and we report all significant effects.

4.2.1. Morality and trustworthiness

As predicted, the ANOVA with ratings of morality as a dependent variable revealed a main effect of decision, $F(1,384) = 99.471$, $p < .001$, such that pursuing inquiry (whether in the form of evidence or explanation) was viewed as more moral than forgoing inquiry. The ANOVA also revealed a three-way interaction between decision, science, and inquiry, such that in cases of "controversial" science, pursuit of inquiry was viewed as particularly moral in the explanation (vs. evidence) condition. This may have been because the pursuit of evidence (but not explanation) was framed as questioning scientific consensus (e.g., needing more evidence to support the consensus that human activity is the main driver of global warming vs. needing an explanation for the unprecedented rise in earth's temperature levels). In any case, the finding that morality was rated more highly when the character pursues (vs. forgoes) inquiry was found in all conditions.

The ANOVA predicting trustworthiness judgments also revealed the predicted effect of decision, $F(1,384) = 45.63$, $p < .001$, with the decision to pursue inquiry associated with greater trustworthiness, as well as the same three-way interaction between decision, science, and inquiry, $F(1,384) = 12.90$, $p < .001$, again showing a heightened importance for explanation (vs. evidence) decisions in the case of controversial science. There was also a four-way interaction between decision, science, inquiry, and gender, $F(1,384) = 9.28$, $p = .002$. While the predicted pattern was observed in most conditions (higher levels of trustworthiness when inquiry was pursued vs. not pursued), there was one exception: when the character was a woman (vs. a man) considering evidence (vs. an explanation) about a "controversial science" topic, trustworthiness was higher when inquiry was not pursued (vs. pursued), $F(1,384) = 6.5372$, $p < .001$. As this exception to the general pattern was not consistent across epistemic conditions (explanation vs. evidence), which otherwise behaved very similarly, we are agnostic as to whether this 4-way interaction is meaningful.

4.2.2. Commitment to truth

The ANOVA predicting perceived commitment to truth also revealed a main effect of decision: pursuing (vs. forgoing) inquiry was perceived as showing a higher commitment to truth, $F(1,384) = 188.47$, $p < .001$. Although this was found in all conditions, the magnitude of the effect did vary, as reflected in several significant interactions. Specifically, the effect was more pronounced in the neutral science (vs. controversial

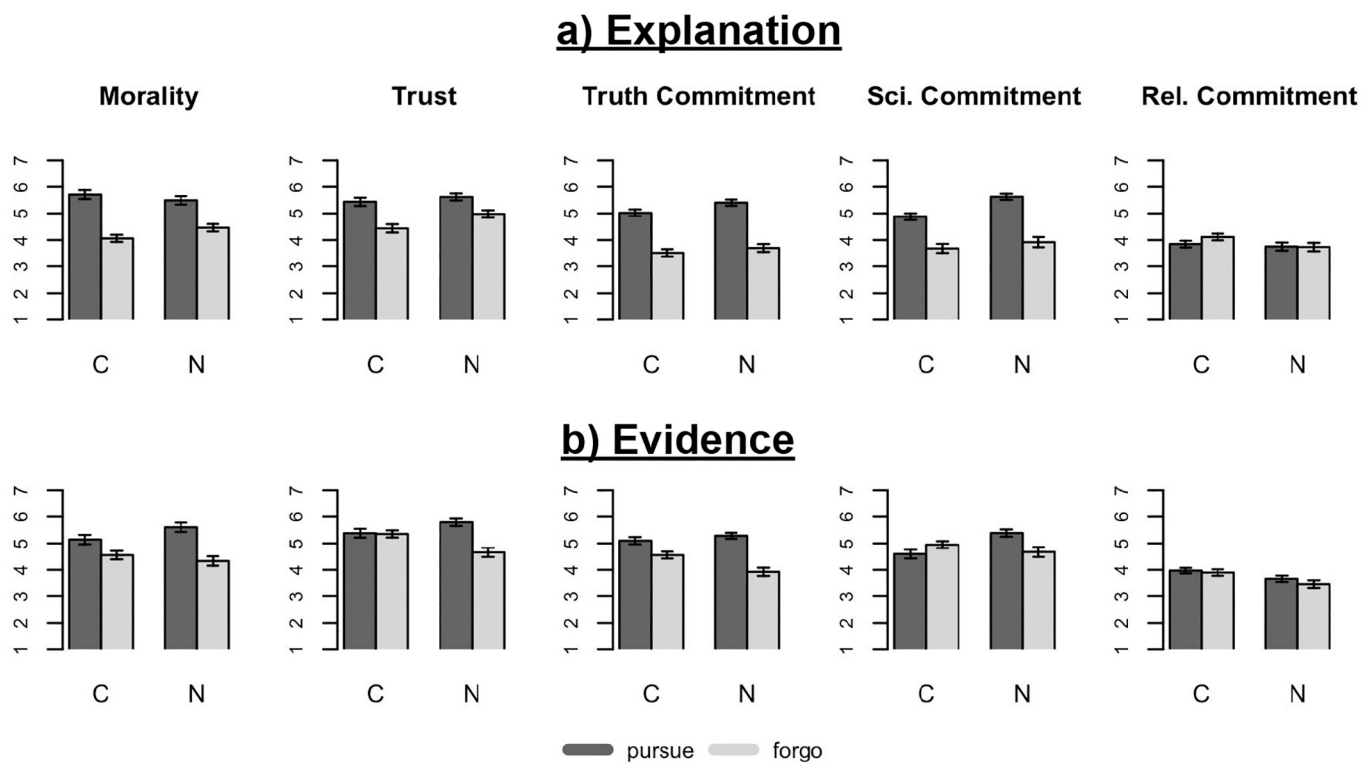

Fig. 3. Inference about a character's morality and commitment in Study 3.
Note. Mean ratings in Study 3 for inferences as a function of science condition (controversial "C" vs. neutral "N") and inquiry condition decision to pursue or forgo further inquiry (indicated by bar darkness), with panel a) corresponding to explanation-seeking and panel b) to evidence-seeking. Error bars correspond to SEM.

science) condition, as demonstrated by a two-way interaction between decision and science condition, $F(1,384) = 7.60$, $p = .006$, and more pronounced in the "explanation" (vs. "evidence" condition), also demonstrated by a two-way interaction between decision and inquiry condition, $F(1,384) = 12.97$, $p < .001$. There was also a main effect of inquiry condition, such that the character in the "evidence" condition (regardless of whether the character pursued inquiry) was regarded as having higher commitment to truth than the character in the "explanation" condition, $F(1,384) = 10.33$, $p = .001$, an effect driven by "controversial" rather than "neutral" science vignettes, as demonstrated by a two-way interaction between inquiry condition and science condition, $F(1,384) = 6.87$, $p = .009$.

4.2.3. Commitment to science

The ANOVA predicting perceived commitment to science also revealed a main effect of decision: the character who pursues (vs. forgoes) inquiry was seen as having a greater commitment to science, $F(1,384) = 59.49$, $p < .001$. This effect was found in all but one condition (described below), but the effect varied in magnitude, as reflected in several significant interactions. Specifically, this effect was stronger for "neutral" science (vs. "controversial" science) vignettes and for "explanation" vignettes (vs. "evidence" vignettes), as demonstrated by a two-way interaction between decision and science, $F(1,384) = 13.89$, $p < .001$, and a two-way interaction between decision and inquiry, $F(1,384) = 35.06$, $p < .001$. The dampening of the main effect of decision for "controversial science" and "evidence" actually reversed when the character was a woman, as demonstrated by a three-way interaction between science, inquiry, and character gender, $F(1,384) = 9.52$, $p = .002$, such that a woman deciding whether or not to pursue evidence about a controversial science topic was rated as having a higher commitment to truth for forgoing inquiry. There was also a main effect of inquiry: characters deciding about "evidence" were seen as more committed to science, $F(1,384) = 10.87$, $p < .001$. Finally, there was also a main effect of science condition, with higher commitment to science attributed to a character faced with a decision about neutral science (vs. controversial science), $F(1,384) = 13.09$, $p < .001$.

4.2.4. Commitment to religion

The ANOVA predicting commitment to religion only revealed a main effect of science condition, $F(1,384) = 10.20$, $p = .001$, such that a character dealing with controversial science issues, rather than neutral science, was viewed as more committed to religion.

4.2.5. Prior agreement with scientific consensus

Although we collected each participants' beliefs about the character's prior agreement on the scientific consensus for all four topics (for example, participants in the "climate change" vignette condition inferred the probability of the character agreeing on the scientific consensus on climate change but also gravitational waves), we decided to restrict analysis of inferred priors to the topic of the initial vignette (e.g., inferences about the character's prior agreement with scientific consensus on climate change for participants in the "climate change" scenario condition, inferences about the character's prior agreement with scientific consensus on gravitational waves for participants in the "gravitational wave" scenario condition, and so on). In this way, we could ensure that participants knew about the scientific topic in question, since they read a detailed vignette about it, and we can test the specific prediction that participants use context-specific epistemic behaviors – e.g., the pursuit of inquiry about a given topic – as a cue to agreement with consensus about that topic. The ANOVA predicting perceived agreement with consensus, with decision, inquiry type, science condition, and character gender as predictors, revealed no significant effects (see Fig. S2 in OSF repository). This suggests that inquiry behavior was not simply used as a basis for inferring a character's prior commitments, where these prior commitments could plausibly shape other judgments about the character (such as their commitment to truth, based on

whether the inferred prior commitment matched or mismatched the participants' own beliefs).

4.2.6. Individual differences

We analyzed the contribution of individual difference variables as specified in our pre-registration document. For each individual difference variable (e.g., participant Belief in science), we constructed mixed effects models predicting each of the main dependent variables (morality, trustworthiness, and commitment to truth, science, and religion) with decision condition, science condition, and the (centered) individual difference variable as fixed factors and character gender as a random factor. To test for individual difference variables, we ran a model comparison between two models, the "full" model vs. a model that removed the interaction between decision and the individual difference variable (e.g., Belief in science). For purposes of interpretability, and going beyond our pre-registration, we first tested whether the three way-interaction was significant (i.e., between individual difference variable, decision condition, and science condition) and always dropped the three-way interaction before testing the two-way interaction (e.g., between individual difference variable and decision condition, or between individual difference variable and science condition). For these analyses, no interaction passed our conservative significance threshold.

We additionally performed the following exploratory analysis: we considered participants' (centered) personal agreement with the scenario-relevant scientific claim (e.g., a participant in the GMO vignette condition's agreement with the statement that "[g]enetically modified crops are safe to eat") as an individual difference variable. However, we found no significant interactions between participant claim agreement and perceived morality, trustworthiness, or commitment to truth, science, or religion.

4.3. Study 3 discussion

In Study 3, we aimed to conduct a more stringent test of the effects observed in Studies 1 and 2. Most importantly, we tested new vignettes about scientific material, introducing a new manipulation about the type of science, with two vignettes about "controversial" science (climate change and genetically modified food) and two about "neutral" science (big bang theory and gravitational waves). Study 3 provided a theoretical replication of the effect found in Studies 1 and 2: the decision to pursue (vs. forgo) inquiry was perceived as more moral and trustworthy and as signaling commitment to truth and to science. Moreover, pursuing inquiry was associated with higher perceived commitment to science, *even for controversial science topics*. In other words, pursuing inquiry concerning anthropogenic climate change or the safety of GMOs, despite reflecting scientific consensus, was perceived as a stronger signal of scientific commitment than forgoing inquiry. However, unlike Studies 1 and 2, which found that forgoing inquiry was associated with increased commitment to religion, we found that the decision to pursue vs. forgo inquiry did not predict perceived commitment to religion with the novel (secular) stimuli, suggesting that inferences about commitment to religion may only be drawn in the context of a religious phenomenon such as near-death experiences or the Shroud of Turin. Study 3 also failed to identify individual differences that moderated inferences from inquiry.

5. General discussion

Keeping track of epistemic behavior is key to learning from others. The present studies provide evidence that people infer a number of moral and social traits from epistemic decisions. Studies 1 and 2 introduced this phenomenon, providing initial evidence to suggest that pursuing inquiry is viewed as a signal of commitment to truth and to science, but that forgoing inquiry is perceived as signaling commitment to religion. These results build upon prior work suggesting that science and religion may have different epistemic functions (i.e., different relationships to explanation and evidence) and that people may be sensitive to this functional distinction (e.g., Davoodi et al., 2019; Davoodi & Lombrozo, 2022a, 2022b, 2023; Heiphetz et al., 2021; Liquin et al., 2020; Van Leeuwen, 2017). Additionally, these studies reveal that a person who pursues evidence or explanation is regarded as more moral and trustworthy. These results contribute to a broader literature about moral inferences from others' decisions (e.g., Everett et al., 2016; Jordan et al., 2016) and potential connections between how people track others' epistemic and moral status (Landrum, Mills, & Johnston, 2013; Marks, Copland, Loh, Sunstein, & Sharot, 2019).

Study 2 also showed that the direction and strength of these effects may be sensitive to individual differences. For example, for more religious participants, the effect of inquiry on inferences of trust and morality diminished; for participants low on Belief in science and the Importance of Rationality, the effect reversed. These variations based on individual differences build on past work on variation in attitudes to evidence and inquiry (e.g., Metz et al., 2018; Ståhl et al., 2016) and raise questions for future research, for example, examining how epistemic norms may vary across cultures and groups. We also expect these norms to vary across types of content: it is noteworthy that the robust effects of religiosity and other individual differences variables observed in Studies 1–2, in response to vignettes about the Shroud of Turin and near-death experiences, were not observed in Study 3, which involved scientific material with less explicitly religious content.

Study 3 showed that these effects extend to four novel scenarios testing politicized (climate change, GMOs) and politically neutral (gravitational waves, Big Bang theory) scientific topics. For both controversial and neutral science, pursuing inquiry was associated with increased inferences of morality, trustworthiness, and commitment to truth. Unlike in Studies 1 and 2, there were no effects with regard to perceived commitment to religion, perhaps because unlike the scenarios in those studies (on near-death experiences and the Shroud of Turin), Study 3 scenarios only tested secular content. That people associate inquiry on "controversial" issues (e.g., looking into climate change) as signaling commitment to science is particularly noteworthy. Especially given reluctance to convey scientific uncertainty in media communications of scientific findings (e.g., Gustafson & Rice, 2020; Jensen, 2008), one might assume that the common perception of what it means to be scientific is to simply defer to scientific consensus without asking further questions. Contrary to this notion, participants in our study found inquiry to be a marker of commitment to science, even for hotly contested issues.

These three studies on social inferences from information search might carry implications for real-world epistemic decisions. People often face the choice between accepting a proposition at face value and searching for more information. Our research suggests the possibility that purely epistemic considerations (e.g., strength of prior evidence, uncertainty) may not fully account for behavior. Social context and reputational effects may play a role in the decision-making process. For instance, someone who wants to signal commitment to religion may be more likely to forgo inquiry, risking false beliefs for potential social rewards (a "display of faith"). Someone could also choose to pursue costly inquiry (high search cost, low information value) to be perceived as more moral and trustworthy (a "display of skepticism"). Although rational-actor models may characterize certain epistemic behaviors – such as forgoing evidence – to be sub-optimal (Good, 1967), such an approach may not properly account for group context and reputational effects. Thus, it becomes unclear what an "ideal" learner or decision-maker should do in a given situation, given that such choices send different kinds of social cues that depend on group dynamics (for relevant discussion, see Wilkins, 2018). An important question for future research is therefore whether and when signaling considerations will influence epistemic behavior, especially given that not all epistemic behavior is public.

The current studies are limited in a number of respects, including the range of materials and underspecified forms of inquiry. Explanation in

particular was not defined in our experimental materials. There are different kinds of explanations, and participants may have differed in what they took an explanation to be. Given differences in the need for explanation across domains (Davoodi & Lombrozo, 2022b; Liquin et al., 2020), and differences in the kinds of explanations offered across domains (e.g., Davoodi & Lombrozo, 2022a; Kelemen, 2004; Lupfer, Brock, & DePaola, 1992), it could be that different kinds of explanations are more or less closely tied to religious and scientific norms.

Another direction for future research concerns variation in attitudes towards science that may not have been reflected in our measures of scientific commitment. In particular, it seems likely that people will sometimes accept a scientific proposition "on faith" (Sorell, 2013), or use scientific claims (e.g., about evolution or climate change) as a way to signal religious, political, or social affiliation (e.g., Bullock, Gerber, Hill, & Huber, 2015; Kahan, Jenkins-Smith, & Braman, 2011). In such cases, inquiry concerning science could look like inquiry (or its absence) in the case of religion, with an abdication from inquiry taken to signal group commitment (even potentially a commitment to being rational or evidence-based, understood as an identity or affiliation). For instance, we thought it was antecedently plausible that participants (especially those high in "Belief in science") would infer that a character who seeks further evidence or explanation concerning climate change has a low commitment to science. However, this isn't what we found: inquiry was consistently associated with a higher commitment to science, even for politicized scientific consensus. Future work could consider how a more (or less) nuanced understanding of science on the part of participants (e.g., Gottlieb and Lombrozo, 2018; Lederman, 1992; Lombrozo, Thanukos, & Weisberg, 2008) and how the role of science in participant identity, might affect our results.

It's important to note that our sample – while diverse in some respects – was restricted to the United States, and drew from an overwhelmingly Christian (and mostly Protestant) population, considerably limiting the extent to which we can make general claims about religion or religiosity. Indeed, we expect a great deal of heterogeneity in religious attitudes towards inquiry, and in the perceived relationship between science and religion (for relevant discussion, see McPhetres, Jong, & Zuckerman, 2021). Future work can explore this heterogeneity, for instance testing religious populations that place greater value on questioning religious doctrine and communities that perceive less conflict between science and religion (e.g., Davoodi et al., 2019; McPhetres et al., 2021).

Despite these limitations, the present work contributes to a growing body of research suggesting that beliefs and processes of belief revision are sensitive to both epistemic and social goals. Researchers have proposed that religious belief serves a social coherence function (e.g., Norenzayan, 2013) and politicized "scientific" beliefs (such as the endorsement or rejection of anthropogenic climate change or human evolution) serve cultural and group identity functions (e.g., Kahan & Stanovich, 2016). As Van Leeuwen (2017) suggests: "If my credence that our god exists can be banished by something so trifling as mere evidence, how can you be sure that I am really committed to our group, which defines itself by allegiance to our god?" Our research shows that forgoing inquiry can be a signal of religious commitment. On the other hand, for most observers, the decision to pursue inquiry is considered the more moral action, and a stronger marker of trustworthiness, commitment to science, and commitment to truth.

Credit author statement

TL obtained funding. MG & TL designed the study. MG performed statistical analyses. MG & TL wrote and edited the paper.

Data availability

In linked OSF

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